Balancing technological and organizational platforms to create knowledge: Linking consultants' experience and literature.

Marc Ingham: Edhec School of Management, (France) and IAG-Université Catholique de Louvain (Belgium)

Caroline Delmeire : IAG- Université Catholique de Louvain, Belgium

Claude Renvoise : Edhec School of Management, (France)

Abstract. The purpose of this paper is to explore the interplay and/or mutual reinforcement between the technological platform (information and communication technologies and systems (ICT/ICS)) on the one hand and organizational platform on the other hand to take advantage of the ICT applications to create knowledge. Emphasis is put on the dimensions that are manageable or at least partly under the control of management.

After a brief presentation of the central concept used - primarily based on Winter (1987) and Nonaka (1994, 2000) - in this exploratory research, we present the results drawn from interviews with consultants in Knowledge management. The methodology is based on qualitative data analysis (Miles & Huberman, 1994). We identify differences as well as similarities in their perception of the role of ICT/ICS and organizational variables in knowledge creation. We also compare the "consultant – business" process with the theoretical frameworks and chosen literature. ICT/ICS applications help to capture, transfer and share existing knowledge. We developed a matrix of ICT/ICS specific contribution in the Nonaka's matrix of four modes of knowledge conversion. Looking at ICT/ICS as a process, a model of "transformation of the information flow" is proposed. The prototype also highlights key dimensions (behaviour and organizational) that are manageable and contribute to develop the process of knowledge creation.

The authors thank Jean Vanderdonckt for creative and fruitful discussions and comments. We also thank representatives from Knowtech, Knowsys and Knoworg for their availability and support.

1. Introduction.

The role of information and communication technologies (ICT) and systems (ICS) in the knowledge creation and learning processes has been discussed and debated in the literature (Andreu & Ciborra, 1996; Cohen, 1998; Davenport & Prusak, 1998; Von Krogh, Ichijo & Nonaka, 2000). In today's business, the ability to favour creativity and knowledge creation is essential to add sustainable value to business. We try to identify the technological and organisational dimensions that can be « managed » in order to create knowledge and so, competitive advantage. Recognizing the opportunities offered by ICT/ICS are one thing, using them to achieve organizational goals is another issue.

Supprimé : The paper recognises the importance of IT, the roles of R&D, the potential impact of IT applications on new business opportunities and it reflects the increasing importance of IT as a source of innovation.

When we talk about **organisational platform**, we try to understand the link between knowledge in people's head, the decisions to which it leads, the impact on groups, the "new" business rules between employees: communication and co-operation among the communities are of course key issues in today's business (Castells, 1996; Selly-Brown & Duguid, 2001). Considering the shortcomings of conventional training programs and the current environment in which organizations operate, the need to adopt innovative approaches to management learning appears urgent." (Bontis & Girardi, 1999) This means that learning must be transferred into practice, action and decisions. Not for its convenience, for the benefit of the workgroup or the organisation. Co-operation is a complex challenge!

As such, neither ICT/ICS nor organisational platforms necessarily create knowledge for the simple and self-evident reason that: knowledge creation is above all a "human" and individual phenomenon and organisational knowledge creation is a social process. "One of the reasons that we find knowledge valuable is that it is close to action. Better knowledge can lead, for example, to measurable efficiency in product development and production. We can use it to

make wiser decisions about strategy, competitors, customers, distribution channels and product and service life cycles." (Davenport & Prusak, 1998)

It may be argued that ICT/ICS platforms enable and enhance knowledge development but they may also constraint and even inhibit knowledge creation behaviours. Such is also the case for the "organisational platforms": strategy, organisational structures, cultures, and human resource management that play a central role as well.

Managers and decision-makers can contribute to create "organisational contexts" facilitating knowledge creation processes to take place: promoting knowledge creation behaviours, building interdisciplinary teams, promoting dialogues among team members and teams, raising up internal turnover, etc. Sometimes people have so much information that they can no longer make sense of it. The importance and difficulty to develop organisational contexts and managerial policies conducive to knowledge creation behaviours also increased dramatically. "Knowledge can also move down the value chain, returning to information and data. The most common reason for what we call "de-knowledging" is too much volume" (Davenport & Prusak, 1998).

Even if streams of literature often stress the role of one platform to the detriment of the other, it should be noted that an increasing number of recent works tend to integrate both dimensions that are inseparable. Consultants' roles in developing the practice of knowledge management and in transferring knowledge have been discussed in the literature. (ISEOR-HEC 2001, Fisher, 2001, Werr, & Linnarson, 2001)

"Much research (see Cohen, 1988, for example) has clearly demonstrated that managing knowledge effectively requires organisational methods and specific plans to support the implementation of technological tools, facilitate their assimilation and permit them to thrive and evolve in line with the development of the firm and of its consultants" (Picq, 2001). From

a “managerial” point of view, the process of knowledge creation at the individual, group and organisational levels (of entities) requires to “balance” ICT/ICS on the one hand and the organisational “platform” on the other hand. The purpose of this paper is to explore the interplay between these dimensions as well as their mutual reinforcement to help to actually take advantage of recent developments in ICT/ICS. Emphasis is laid in this article on the dimensions that can be “managed” or at least are, to a certain extent, “under the control” of the management.

As resources, ICT/ICS greatly contribute to reduce the costs and to increase the speed of transmission and diffusion of data, information and ideas. The contribution of ICS at each stage of the process of identifying, collecting, organising, processing, sharing, storing and diffusing data and information are central. Effectively managed, ICT/ICS would improve the quality and “on time” availability of information, reduce information “overload”, facilitate information sharing and finally would enhance business activities and decision making processes.

If the availability of information and the opportunities offered by ICT/ICS to share and create knowledge has increased dramatically, this has not always led to an improvement in our capability to effectively share and create knowledge.

The importance and difficulty to develop and manage ICT/ICS has increased dramatically in recent years for several reasons:

- ICT/ICS have led to deal with high-speed and high volume of data transmission, high density of interconnectivity (frequency, number of sources and agents (database, staff, and institutions…), high quantity and diversity of sources of information. However, in some cases the results obtained are under the expectations.
- The speed of technological change and the complexity of ICT/ICS are high, leading to organisational difficulties in their implementation.

Supprimé : ¶
The “organisational and platform” also plays an important role in the organisational learning and knowledge creation processes. ¶
“Organisational” variables cover a wide range of related dimensions such as strategies, structures, cultures, managerial practices, etc…¶
Both platforms can promote and enhance knowledge creating behaviours but also inhibit these behaviours. ¶
¶
The role played by these variables in knowledge creation processes has been extensively developed and discussed in the literature. Our focus is here on the dimensions that are at the core of the interface between ICT/ICS and organisational platforms and that can be “managed”. More specifically, emphasis is laid on the “contextual” variables and managerial practices facilitating an “adequate” use of ICT/ICS to create knowledge.¶
¶
As such, neither ICT/ICS nor organisational/behavioural platforms necessarily create knowledge for the simple and self-evident reason: knowledge creation is above all a “human” and individual phenomenon and organisational knowledge creation is a social process. 1.3. Management

Mis en forme

Supprimé : ;

- The possibilities offered by ICT/ICS (e.g.: Intranet, Internet) are so high that they often create an "information overload" or "fog" and are often used at a very low rate of their capacity. If much of the functionalities of the system are not used, the benefits to people are marginal and not perceived.

Today enthusiasm over specific "Knowledge management" practices that developed and proliferated in the early nineties seems to decrease, probably partly for the following reasons:

- Results drawn from the huge investments made in ICT/ICS and their applications (for example database such as the so-called "yellow pages" designed to identify people and competencies) were below expectations (Byosiere & Ingham, 2001).
- The "functions" created "from scratch" such as Chief Knowledge Officer, etc. proved to be in certain cases not effective in the results obtained. In some cases, giving an executive explicit responsibility for knowledge has been a positive change. But the fact that just one manager is assigned to such an unwieldy task points up the limits of the approach. (Von Krogh, Ichijo & Nonaka, 2000). In other words, knowledge work must be collective, not personal. Individual and collective "resistance" or "reluctance" to share information and knowledge can be problematic. Having THE information is sometimes a unique opportunity for some managers to establish their power and control within the organisation or between organisation and suppliers.

If neither ICT/ICS nor organisational platforms can create knowledge, some prerequisites or "conditions" for knowledge creation can be identified in the search for a " balance" between both platforms, enabling to give rise, to guide and to shape these processes. It should be noted that ICT/ICS may not only support the knowledge creating process but they may also modify the organisational context itself and become a part of this context. The central question

Supprimé : ¶
Managers and decision-makers can contribute to create "organisational contexts" facilitating knowledge creation processes to take place: promoting knowledge creation behaviours, building interdisciplinary teams, facilitating dialogues among team' members and teams, raising up internal turnover, etc…¶
The importance and difficulty to develop organisational contexts and managerial policies conducive to "knowledge creation behavio

Supprimé : Etc…

addressed in this paper arises: What about the balance (interplay and reinforcement) between ICT/ICS and organisational platform to help knowledge creation to take place?

After a brief presentation of the central concepts and frameworks used in this exploratory research, the second part of the paper presents the methodology and the third deals with the results drawn from interviews with consultants from "KNOWTECH", "KNOWSYS" and "KNOWORG". Our objective was to select three "a priori" different and complementary approaches of "Knowledge development" We identify differences as well as common traits in their perception of the role of ICT/ICS and their interactions with organisational variables in the processes of knowledge development. We try to provide new perspectives through our interpretation of the identified variables. We bring concepts as knowledge, organisation and ICT/ICS together in order to suggest new directions to regard ICT and organisational change.

The body of literature on Knowledge Management is so rich and abundant (Despres & Chauvel, 2001) that we concentrated our analysis on the founders of the theory of knowledge creation (e.g.Nonaka 1994, Nonaka &Takeuchi 1995; Davenport & Prusak, 1998) who, in our opinion, developed theories and insights into how organizations can locate, capture and create knowledge as a source of competitive advantage. We also analysed authors who specifically brought concepts as "organisational learning" and ICT together (Andreu & Ciborra, 1996). Literature that includes both perspectives is critical to understand organisations in a challenging environment of globalisation. In this sense, we started with data collection to highlight key issues.

2. Central concepts and frameworks.

The central concepts and frameworks used to begin this exploratory research are primarily based on Winter (1987) and Nonaka (1994).

2.1. Information and knowledge.

Although the term's information and knowledge are often used interchangeably, there is a clear distinction. According to Machlup (1983) (cited by Nonaka & Takeuchi, 1995), information is a flow of messages or meanings, which might add to, restructure or change knowledge. "In short, information is a flow of messages, while knowledge is created and organised by the very flow of information, anchored on the commitment and beliefs of its holder. This understanding emphasises an essential aspect of knowledge that relates to human action (Nonaka, 1984)". In this article we follow Nonaka and Takeuchi (1995) in their description of how knowledge is similar to and different from information. Information has mainly to do with codified or articulated components of knowledge but knowledge can be defined as "justified true belief", a much more broad and rich concept. "Knowledge, like information, is about meaning. It is context specific and relational". "Knowledge, unlike information, is about beliefs and commitments". "Knowledge, unlike information, is about action. It is always knowledge to "some end" (Nonaka, 1994).

2.2. Tacit knowledge and articulation

It should be noted that some confusion concerning tacit knowledge exists in the literature. Tacit knowledge is often erroneously considered as being, by nature, not articulable. But it is necessary to make some distinctions among the types and components of knowledge to discover to what extent some dimensions of tacit knowledge can be articulated, even if articulation is difficult and necessitates long and hard efforts.

From a more practical point of view it may be argued that tacit knowledge includes cognitive (mental models) and technical (know-how, skills, crafts, etc.) elements (Nonaka &Takeuchi 1995). The cognitive dimension covers "mental models" in which human beings create working models of the world or "frames of reference" enabling the individuals to provide meaning, to interpret and to make sense from information. Being "tacit" does not mean that the knowledge in question is not articulable. Most tacit knowledge could be articulated even if the process of articulation is not fully completed. The key issue lies in the articulation or codification processes, translating and transforming tacit knowledge into explicit one (in explicit codes or language such as words, sentences, formulas, graphs, drawings, diagrams, pictures, etc). Traetteberg (2001) uses the concept of "design representation" to insure the conversion of knowledge between tacit and explicit forms. "By "design representation" we mean any design relevant knowledge that is externalized in a human-readable medium, whether textual, graphic or multimedia". Nevertheless we encounter two "obstacles " in the process of codification and articulation.

Supprimé : ¶
Different kinds of tacit knowledge can be identified; knowledge as skills (procedural knowledge or know-how") and knowledge of "facts" and relationships (substantial knowledge or know "what" (Häkanson, 2001).

2.3. Two limits in the knowledge codification and transfer:

1. The first one is due to the type of knowledge, especially the content of tacit knowledge: mental models include culture, education, practice, training, and passion… Consequently some knowledge is partly or largely not expressible in an explicit content. Take for example a research scientist, a musician, an artist … "the distinctive style can barely be described in words, much less externalised in a way that would allow someone else to play in an identical way»…. "This is why the codification process for the richest tacit knowledge in organisations is generally limited to locating someone with the knowledge, pointing the seeker to it, and encouraging them to interact". (Davenport & Prusak, 1998) In this way using the technologies of "Computer Mediated Communication" (CMC:

Intranet, internet, Lotus note) can facilitate the discussions. The repetitiveness of contacts (without time and distance limits) can also enable the seeker to capture and to structure the patterns of tacit knowledge.

2. Secondly articulation and codification are not enough. To guarantee an efficient transfer of information or explicit knowledge the "receptor" or the "knower" must be able to understand the meaning of information (the codes used)."Codified knowledge can be communicated as "information" but it is well known that members of organisations tend to develop idiosyncratic coding schemes, reflecting their common, generally tacit, interpretation of the world and their own roles within it… Thus, codes, like the knowledge they express - have both tacit and explicit dimensions". (Häkanson, 2001). This is one reason why communication with other departments within an organisation is often difficult. Efficient transfer of information takes time and effort: the recipient must understand (or learn the codes) or the sender must translate the messages. This requires efforts, time, investments, and dialogue…. Often based on a trade off between costs and benefits. In the same way, "design representation is about making choices" (Traettenberg, 2001) concerning which information's are used and how they are composed to support structure. Making these choices requires knowledge. Anthony Giddens (1990) (cited by Brown & Duguid, 2001) suggests that "as knowledge is disembedded in one place to be reembedded in another, the critical question concerns the degree to which the embedding conditions at both ends of the communication are similar". ICT/ICS allows people to communicate across space and time, the challenge is to communicate across different communities which are organised around different practices.

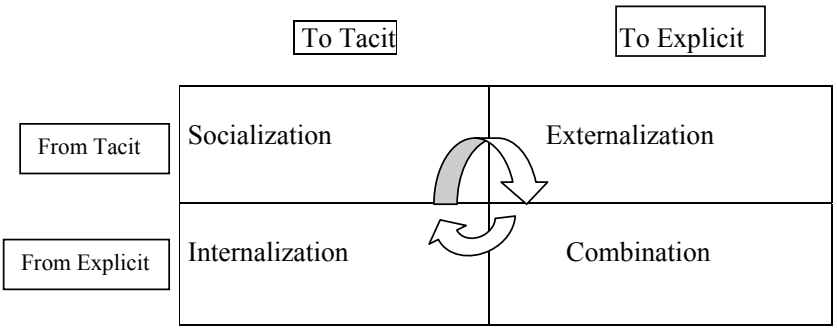
Supprimé : But articulation and codification is not enough. To guarantee an efficient transfer of information or explicit knowledge the "receptor" or the "knower" must be able to understand the meaning of information (the codes used)."Codified knowledge can be communicated as "information" but it is well known that members of organisations tend to develop idiosyncratic coding schemes, reflecting their common, generally tacit, interpretation of the world and their own roles within it… Thus, codes, like the knowledge they express - have both tacit and explicit dimensions". 'Häkanson 2001, p.32)

2.4. The knowledge creation process.

Nonaka developed a theoretical framework that provides an analytical perspective on the dimensions of knowledge creation: the SECI model (Figure 1). Its central theme is that organisational knowledge is created through a continuous dialogue between tacit and explicit knowledge. Organisational knowledge creation should be understood in terms of a process that amplifies the knowledge created by individuals. Four modes of conversion between tacit and explicit knowledge have been identified (Nonaka, 1994, Nonaka & Takeuchi, 1995). The first is **socialisation**; "a process of sharing experiences and thereby creating tacit knowledge such as shared mental models and technical skills". The second stage is "**externalisation**": "a process of articulating tacit knowledge into explicit concepts". "Among the four modes of knowledge creation, externalisation holds the key to knowledge creation because it creates new, explicit concepts from tacit knowledge". Effective and efficient externalisation can be performed by a sequential use of metaphors, analogies and models. The third is "**combination"**, a process of systemising concepts into a knowledge system. "Individuals combine and exchange knowledge through such media as documents, meetings, telephone conversations or computerized communication networks". The fourth is **"internalisation**": "a process of embodying explicit knowledge into tacit knowledge.". The knowledge creation process takes place and develops like a spiral at different "levels" of entities: individual, group and organisation.

Supprimé : The knowledge creation process takes place and develops like a spiral at different "levels" of entities; individual, group, organisation.

Figure 1 : Nonaka's four modes of knowledge conversion



"The interactions between tacit and explicit knowledge will tend to become larger in scale and faster in speed as more actors in and around the organization become involved. Thus, organisational knowledge creation can be viewed as an upward spiral process, starting at the individual level moving up to the collective level and then to the organisational level (Nonaka, 1994)". That makes the company and the technology just as important.

2.5. The potential roles of ICT/ICS in knowledge creation.

The ICT/ICS platform primarily deals with articulated or explicit knowledge, which is at the "top of the iceberg" of organisational knowledge creation. It should be noted that recent developments in ICT/ICS have largely facilitated the refinement and diffusion of explicit knowledge, irrespective of geographical and, to a certain extent, cultural distances. Nevertheless, the roots of knowledge creation are, to a certain extent, made of tacit (or implicit) knowledge. As mentioned above, potential contributions of IT/IS to the process of externalisation or articulation are central.

Such is not yet the case for tacit knowledge, which must be communicated "face-to-face" or at least necessitates dialogues among individuals and groups (via the use of analogies and metaphors). But dialogue (in a broad sense) does not necessarily need face-to-face

relations and interactions; media such as email, GroupWare (written) and videoconferences (oral) can help to communicate and share elements of tacit knowledge that can be articulated. Moreover, ICT/ICS such as "expert systems" and "artificial intelligence" could contribute to the effort of articulation. New developments in IT such as Case-Based reasoning Systems (CBRS), Expert Systems (ES), Group Decision Support Systems (GDSS), Cognitive Mapping and Artificial Neural Networks can support some aspects of organisational learning processes and organisational transformation. "It can be expected that in the coming years these tools, together with management's commitment, will play a central role in supporting organisational learning." (Galliers & Baets, 2000)

The contributions of an "intelligent use" of ICT/ICS to the learning processes and their management have been identified (Andreu & Ciborra, 1996). To a large extent, similar benefits can be drawn from their use in knowledge creation processes and knowledge management. IT is a reporting medium but also a tool, which enables the organisation to learn from itself and to create and foster a knowledge base. "Richer communication via e-mail and Groupware for example can enhance single loop learning and double loop learning. (Galliers & Baets, 2000)". In this context, ICT offers different tools but you also need to foster a changed attitude towards their use. ICS needs to be designed in such a way that it is adaptive to the individuals or groups.

Supprimé : ¶

Supprimé : .

Supprimé :

Two main types of ICT/ICS can be identified. The first are designed to help individuals and groups to find and retrieve the information they want. In this situation individuals guide the system to collect data and information and actively intervene in the process. In the second situation, the interaction leads the user to suggest something to the system, the system in turn suggests information, correlation and other things; the user reacts, etc. The "good" logic and practice would be to develop ICT/ICS that enable this interaction to take place harmoniously.

ICT/ICS are rather "determinist". One key issue is to develop and use ICT/ICS that do not -Reduce or deteriorate too much the nature and the meaning of information during the codification process; - Constrain or narrow the set of possible interpretations and sense making by individuals. It is self-evident that individuals will interpret a "given information" differently but the ICS sometimes reduce the scope and constraint the process.

It should be noted that depending on their nature, structure and organisation, the ICT/ICS components would enable to guide and aid interpretation and sense making. Sometimes, they could, at least partly, serve as a substitute for user's capabilities to interpret the information. Landry et alii (1996) (cited by David, 1998) distinguish between two main organisational functions of models: enabling and constraining. The enabling function corresponds to the fact that a model generates knowledge and improves the understanding of the situation. The constraining side means that the tools for thinking and suggesting impose a framework for thought and, whether explicitly or not, for action. ICT/ICS have to be designed to provide the user with **several levels of responses** (for instance: to discover a problem and/or to obtain assistance to solve a problem). We tried to understand the ICT/ICS opportunities in terms of learning process, specifically related to the SECI model (Nonaka, 1994). In Table 1, we identified different potential functions of ICT/ICS in the process of "knowledge conversion".

Supprimé : . . The main goals here are aim to transfer and share (transform, understand, globalize…) the knowledge and experiences throughout the organisation. Sharing the knowledge through human computer interaction and computer mediated communication is a new challenging process for each individual and group.

Mis en forme

Supprimé : responses

Mis en forme

Mis en forme

Table 1 presents the matrix of ICT/ICS' specific applications and their contribution at each stage of the SECI matrix (type of conversion, Nonaka, 1994).

Type of conversion	Potential Associated functions	Examples of ICS
Socialisation (tacit to tacit) Share *each* other's *thinking* process Support interaction via analogies	***Locate and share***:	**Computer Mediated Communication:**, Email, Groupware, Videoconferences multimedia computing, intranet, internet.
Externalisation (tacit to explicit) Reveal hidden tacit knowledge	***Capture, share, and codify***	**Computer Mediated Communication:** Email, Groupware, Videoconferences multimedia computing, intranet, internet.
Combination (explicit to expl.) Combine different bodies of explicit knowledge.	***Formalise, structure, Reconfigure***	**Artificial Intelligence** **Library-Document Management**
Internalisation (explicit to tacit) Learn by doing, exploration, experimentation, refinement of existing knowledge	*Exploit and refine, Explore, experiment, predict.*	**Artificial Intelligence**

Library / document management: The system is mainly designed to capture, to store, to find and retrieve information. The individual guides the system. For ex. : datawarehouses, yellow pages, repositories systems, thinking tools
Artificial Intelligence: The interaction leads the user to ask something to the systems, which in turn suggests information. Experts systems, datamining, Case-base reasoning, group decision support systems
Computer Mediated Communication: make it possible to connect people who need to share knowledge over a distance.

The matrix suggests that ICS tool favour "combination" (explicit to explicit) type of conversion of knowledge. Information technologies and systems are undoubtedly critical sources of information but knowledge creation is also made of tacit knowledge that must be communicated «face to face» or at least via the use of analogies and metaphors. A fundamental issue raised by this research is the role and use of technology. The matrix offers a first insight, but we have to deepen it with additional research. The aim of this exploratory research is also to understand the way consultants in Knowledge Management are classifying and implementing the ICT/ICS.

3. Methodology

The strategy and the methodology applied in this exploratory stage of the research consisted in four phases: selection and recruitment of the "experts", data collection, data analysis and interpretation. Our objective was to select experts who developed their consulting activities in Knowledge management or Knowledge creation based on "a priori" contrasted background corresponding to both platforms ICT/ICS (information systems) and Organisational behaviour. Our intent was to select experts having developed approaches related to our own complementary fields of research. This would enable us to better assess and interpret information. Experts were selected after a two-stage process: A list of organisations and individuals (consultants) active on the Belgian market was established on the basis of published "external" documents (presentations, web sites, publications). A decision was made not to select big consulting firms, organisations who "a priori" did not developed "original" approaches or limiting their activities to the sales of products available on the markets, etc.

Data collection was made by means of interviews, documents and other sources such as websites and articles. Interviews were based on "open" questions". Two researchers were present to the interviews. The first was in charge of asking questions and the second took notes. Each interview was recorded and fully transcribed. The average duration of each interview (7) was of about three hours. Data analysis was performed by use of qualitative analysis (Miles, & Huberman, 1994). Two researchers were involved in the "coding" activity at the beginning of the process in order to compare their interpretations. Lists of "primary codes" were produced and compared. Documents were used either to assess or to complement information drawn from the interviews. Codification process was performed in three stages: identifying key terms and excerpts from interviews- grouping in search categories- comparing across dimensions and experts to establish relations among categories. Interpretation was performed in two stages. We first made an attempt to understand the "conceptual models" or

Supprimé : . Exploratory

Supprimé : They were progressively refined during the "interpretative" stage.

"frameworks" of experts from KNOWTECH, KNOWSYS and KNOWORG to deal with the central issues addressed in our research. Then, the codes were progressively refined. We identified key relations/connections among between codes, analysed the frequencies, weight of codes and relations and finally interpreted them. We tried to identify the similarities as well as the differences in each stage of the process used by the experts to develop our interpretative framework in the light of the literature.

Supprimé : ir

Supprimé : ir

4. Lessons from KNOWTECH, KNOWSYS, KNOWORG

The section is intended to provide a brief introduction of the selected organizations. We describe the background, context and the content of our discussions. Figure 2 summarises the different approaches. As a result of the analysis, the investigations and the literature review, we came to an interpretation and conclusions.

To assess the opinion of our respondents we started the interviews with a question asking to describe a "typical" consulting activity and continued with open questions. The combination of codes and "meta codes" (appendix 1) enables us to interpret the data and to progressively build our interpretation. We first try to identify the central issues addressed by the respondents from KNOTECH, KNOWSYS and KNOWORG and the lessons they draw from their experiences in supporting knowledge management or development. This will lead us to identify a first set of variables in both "platforms" and their relations. Then we attempt to build a more aggregate interpretative scheme based on similarities as well as differences between the three cases.

Table 2 : LESSONS FROM KNOWTECH, KNOWSYS, KWOWORG

KNOWTECH

Process	Look at the techno in place →	How are ICS/ICT used ? →	What is available on the market ? →	Implement ICT/ICS (standard)
Key Factors		Understanding	Assessment	Behaviour & Org.
	Dialogue, consensus, langage CEO support	Concepts, issues Use of ICS Avoid complexity	Difficulty to assess	Role of pluridisc. teams & leaders Facilitate exchange, share of experiences

Towards an interpretation : The respondent addressed almost exclusively explicit knowledge. He insists on the central role of adequate and proactive behaviour to get the best of ICT/ICS. His approach of KM is essentially based on the combination of explicit knowledge …

KNOWSYS

Process	Understand central concept →	Good analysis : users/ needs →	Develop ICT/ICS that fit (tailor made)
Key factors	Analyse info flow in place Establish maps (sources, flow..)	Users needs/ users visions Avoid to adapt your organisation Favours information Quality	Facilitate interactions ICT/users (Education) Human abilities to interpret info

Towards an interpretation : Knowsys focus on the role of Information systems and explicit knowledge. He also argues that knowledge is made of both explicit and tacit components. Informal network is even important to share ideas and experience.

KNOWORG

Process (circular)	Look & adapt broad view →	Compare cognitive maps →	Promote dialogue →	Knowledge creation behaviour
Key factors	Involve users, educate CEO Support, no org. barriers Avoid info overload	Compare visions about issues	Instil dynamic process in exchange of tacit and explicit knowledge	

Towards an interpretation : The respondent clearly situates in an organisational perspective putting emphasis on global concepts. He insists on the interplay of tacit and explicit knowledge and the behaviours that are at the centre of knowledge creation. Technology includes hard, soft and humanware (adapt a broad view to understand the interconnected dimensions).

4.1. Introducing KNOWTECH, KNOWSYS and KNOWORG

Mis en forme

Founded in 1986, KNOWTECH is a spin off of a European Research centre. With 180 employees in 2001, the company has developed a range of products and services in two main divisions: Retail and Distribution and Solution and Consulting (SC). The first division develops ICT products and has built leadership positions in selected activities through internal development and acquisitions. The SC division provides "customised software solutions and services related to data entry, conversion, indexing, storage, search and transmission and take the full advantage of Internet". In the field of data management the company offers a complete and flexible solution thanks to its modular architecture (company web sites). KNOWTECH has recently created a consulting department in Knowledge management. This department (3 persons) helps clients to define their needs in KM and to find "ad hoc" and customised solutions. Client's range from small and medium sized firms to large multinational companies and institutions.

Mis en forme

The former Chief Information Officer of a large European Bank has created KNOWSYS in 1995. This expertise in ICS led to the development of a consulting firm devoted to the diagnosis of Information Systems and Information flows to provide solutions in "Knowledge Management". Today the company is organised as a "network" of individual consultants. The "leading" consultant realises long term contracts with a few numbers of clients in sectors such as Telecom and Banking.

Mis en forme

KNOWORG was founded in the middle of the nineties by an academic specialised in organisational behaviour and organisational knowledge development. Besides his academic activity, this person has acted since 1990 as a consultant in Knowledge development for R&D teams in large MNCs as well as medium sized enterprises.

It appears from the interviews that each consultant use a different methodology (process) and deal with central issues (organisational, behaviour or technological).

4.2. Lessons drawn from KNOWTECH.

Context.

KNOWTECH has developed its expertise in IT/IS equipment and software. The company has recently created a division specialised in Knowledge management in order to provide customers with "global solutions". In the first example taken by KNOWTECH's representative, the objective was to correct past managerial actions that failed in improving the information flows among groups of top and middle managers. These actions were focused on the organisational platform. The organisational and cultural contexts seem to have an impact on the behaviours of individuals and sub-groups. He also insists on the power and empowerment of information and the way to manage it. He highlights the paradox: more and more people need to co-operate and to share information to be competitive but in the same time, people are more and more individualist, egocentric. There is a cultural gap and of course using ICT can be difficult to admit.

The conceptual framework used by KNOWTECH in the consulting activity is classical. We can schematise as follows; -Look at the technology in place; -make an audit; - look at the applications available on the market; - implement .The solution provided by KNOWTECH at the beginning appears to be highly constraining and almost exclusively based on the ICT/ICS platform.

- A second set of problems can be identified during the preparatory stage of the ICT/ICS diagnosis. The key is to look at the technologies in place and how they are used and at what is available on the markets in order to select the "right" ICT/ICS

Supprimé : This choice was made because of the failure of past managerial actions

Mise en forme : Puces et numéros

Mis en forme

platform. KNOWTECH stresses the difficulty to assess the value of the ICT/ICS solution offered on the market. -The return on investment in ICT/ICS is perceived as poor or at least as being below expectations; - The costs of ICT/ICS are often underestimated, in particular the cost to maintain and update the information system; - The lack of useful basic functions in the existing ICT/ICS enabling an easy transfer of information; -The wrong or poor utilisation of the existing ICT/ICS can limit the storage and the transfer of knowledge. Research show that we use about 5 to 15 % of the functionality offered by ICT applications.

Supprimé : ¶
¶
. The difficulty to assess the value of the ICT/ICS solution offered on the market¶
.

Supprimé : .

Supprimé : .

Supprimé : .

Key issues to overcome these problems and difficulties are the following -Have good understanding of what is in place in ICT/ICS; - Scour the systems in place and avoid complexity: keep ICT/ICS as simple as possible.

Mis en forme

Critical success factors during the implementation stage of the project relate to the "organisational platform" and especially on behavioural variables: -Building a team of highly motivated people from different departments and hierarchical levels is very important; - The team leaders (her or his personality and behaviour) are at the very centre of successful KM processes.

Mis en forme

Supprimé : and

Supprimé : .

Other prescriptions are the following: -Do not constraint or enforce employees to use the ICS but support them to adopt a creative behaviour and not a bureaucratic one. This is especially important in R&D activities; - Create organisational contexts that facilitate the exchange and share of experiences, draw lessons and learn; -Support individuals and groups in their efforts to discover the relations between innovation, creativity and knowledge.

Supprimé : .

4.3. Lessons drawn from KNOWSYS

Context

KNOWSYS has developed an expertise in the design and implementation of Information systems. This consulting firm has recently expanded its activities to knowledge management.

Even if the experience covers different situations in various organisations, the respondent took the example of an innovation project led in a European bank to illustrate the role played by ICT/ICS in these projects.

The process used by KNOWSYS is classical and sequential. In this project, the first steps were: (1) to rightly understand the meanings of the central concepts; (2) to make a good analysis of the users vision, needs and expectations about the ICT/ICS; (3) to develop ICT/ICS that fit as much as possible with these expectations.

The key success factors and actions to be taken during the early stages of the projects are the following: -Analyse what is in place in terms of circulation and distribution of information; -Create a system enabling to easily enter and store documents; -Consider the characteristics of information to create the ICS: time, functions, use, context); -Establish a "Map" of sources and flows of information; -Do not impose standardised ICT/ICS in the organisation; -Use simple and reliable systems to relate databases and facilitate search.

Enablers at the second stage of the process are the following: - Identify key information users need and build IT/IS that fits their needs: producing the right information at the right time; -Consider ICT/ICS as means to develop knowledge and not as ends; - Design efficient and effective "workflow" driven by external and internal customers acting as active "receptors". (Users "pull" information and in turn either add value to information or act as end-users); -Clean the table from outdated and useless programs and

Supprimé :) to keep them involved in the process,

Supprimé : (4)

Supprimé : *The key issue was to develop an Information system to facilitate risk management. The first step was t*

Mis en forme

Supprimé :

Supprimé :

Supprimé :

Mis en forme

Supprimé :

Supprimé :

Supprimé :

applications that create confusion; -Prefer quality to quantity in information load and ICS; - Keep the process as simple as possible and avoid using complex blindly systems that create an information overload. - Focus the system on "what is central"; -Avoid having to adapt the organisation to the ICT/ICS and choose systems that are flexible and adaptable to the organisation; -Do not forget that ICT/ICS are just means to develop knowledge and not ends.

Some prerequisites for a right use of ICS can be identified. -Develop a context that facilitates the interactions between users/ICS/ICT; - Invest in education as well as in ICT/ICS; - Do not forget that knowledge depends on human abilities to interpret information and to use it in managerial actions.

Supprimé :

Supprimé :

Supprimé :

Supprimé :

4.4. Lessons drawn from KNOWORG

Context.

KNOWORG has developed an expertise based on academic research in organisation science and knowledge creation. Its founder and representative is a consultant in R&D projects for firms in a variety of sectors, high tech and mature markets. The understanding KNOWORG' representative has of the central concepts of technology, information and knowledge is very broad. Technology includes hardware, software and "humanware" and it is difficult to separate them. Such is also the case for technology, R&D and innovation. The field is rooted in modern communication, computer and human sciences. Computers and computation are the most prominent common denominators.

The process used by KNOWORG is circular, multidimensional and never-ending.

As we can see, dialogue or conversation is central. Because each individual is building his/her own perspective based on his experience and education. “The perspectives

remain personal unless they are articulated and amplified through social interaction" (Nonaka, 1994). Although this may seem obvious, few companies to date have made relationships a priority (Von Krogh, Ichijo & Nonaka, 2000). The process can go wide or narrow in function of the context and the demand. Anyway, you must always involve users and have the support of top management. Again everybody must collaborate. The key dimensions and the main recommendations during the first stages of a project of knowledge creation are the following: -look at what is on the table and adopt a broad view on interconnected dimensions: technologies, processes, strategies, structures, cultures, managerial issues and human resource management; -look at ICT/ICS but neither underestimate nor overestimate their importance in the process of Knowledge creation; -Lay emphasis on education to get the best of ICT/ICS; - do not create information overload or big databases that are not well designed and do not meet users' expectations;-Provide the users with a good ICT/ICS support;- do not create unnecessary organisational barriers to the transfer and sharing of information.

Supprimé :

Supprimé :

Supprimé :

Supprimé :

Supprimé :

Supprimé :

Organisational platform and Knowledge creating behaviour.

There is no one best way to engage a team or a company in Knowledge creation: you can go wide and narrow or the opposite. The key success factor during the first stages is to stimulate Knowledge creating behaviours. Knowledge creation is guided by an "end" and is a dynamic process in exchanging tacit and explicit knowledge. Every organisation develops both explicit and tacit knowledge and this is good behaviour to share knowledge at all levels, individuals, teams, etc.

Mis en forme

Enablers and inhibitors of knowledge creating behaviours can be found everywhere: in strategy, structure, culture, etc.

The second stage of the process consists in representing the cognitive maps of each group of actors. The objective is to compare their visions about a same set of issues. This is used to engage a dialogue among team members and to create a concept of what is knowledge creation for this company. The evaluation stage of this kind of project is very difficult and probably impossible but…if you proceed on the right way rewards will follow.

Mis en forme

Mis en forme

5. Conclusion and discussion.

The objective of this paper was to explore the contributions of ICT/ICS to the process of knowledge development as well as its balance with the organisational platform. A decision was made to compare the experiences of three a priori contrasted KM approaches and to draw lessons from experts in these fields.

Supprimé : in R&D teams

In conclusion, we will present a summary of key points mentioned by the experts – and the literature (point 5.1). As a result of literature review and exploratory research, we conclude with a model, which describes the main stages in the transformation process of the information flow in a technological context (5.2.). One of the objective is to help understand and to position each expert in his consultancy activity. In the same time, the identification of constraining or enabling variables can help managers to instil a dynamic and continuous process.

Supprimé :) between

5.1. Common issues

The results presented in this paper show that even if different paradigms guide the perceptions and actions of consultants, common issues are identified. Experts stress -the importance of the audit and diagnosis (good understanding of current situation)- the importance of dialogue, transparency and the use of a common language- the role

Supprimé : posterioroe¶

Mis en forme

Mis en forme

played by CEO and top management in the project, keeping users (having different backgrounds) involved at each stage of the process. Consultants also highlighted the difficulty to assess the results and benefits of new ICT/ICS systems. They stressed that ICT/ICS projects supporting knowledge development and management are not sequential but circular and continuous and cover educational, managerial and organisational dimensions at each stage. According to the consultants, codification and transfer are long lasting processes that take time and lot efforts. There is no one best way and no "magic solutions".

1. One of the key issue mentioned by the consultants is a continuous process of dialogue, exchange, … in order to think on an idea in a collective way which assures comprehension, co-operation between groups and deeper and a longer view in strategy / management. The objective is to reach a consensus in the use of concepts. "Knowledge creation is a social as well as an individual process. Sharing tacit knowledge requires individuals to share their personal beliefs about a situation with other team members. At that point, justification becomes public; each individual is faced with the tremendous challenge of justification, explanation, persuasion and human connection that makes knowledge creation a highly fragile process".

2. The other key issue is the understanding of the formal and informal network. ICT support often links task and workflow (Process re-engineering) and thus people are seen as elements to keep the flow moving. The alternative perspective is to put emphasis on work practices aside from the formal written procedures; there is a community that helps get the work done. Focus is also on the tacit, informal way in which people organise and support each other; ICT development must be fitted into this world rather than simply been imposed.

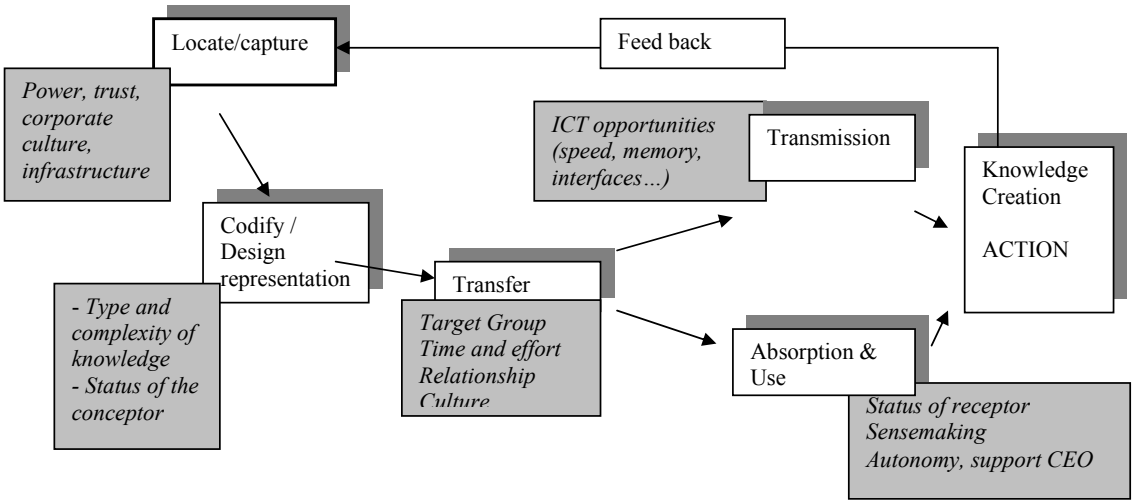
Supprimé : ¶
<#> . ICT/ICS offer a great potential as enablers of Knowledge development but they can also inhibit knowledge creative behaviours¶

You need a thorough understanding of ongoing work process and how physical support and social aspects (skills and shared practices) support them.

5.2. A model proposition and key dimensions

Based on the empirical and theoretical identification of variables, we gradually developed a conceptual scheme (prototype – Figure 2) that could help to manage the organisational context and enable to suggest some managerial action to be taken. We identified key stages and for each we mention some of the technico-organisational variables (in italic) which could improve or could be managed to facilitate the transformation flow. Each stage of the process is a critical one in the sense that you can break down, divert or interrupt the flow.

Figure 2 – "Transformation process of information flow in a ICT/ICS platform" – an emergent model.



- First, firms try to locate and capture valuable company knowledge. They focus on the contents of knowledge held by key individuals. Social, economical and political realities must be taken into account. . "People need to be motivated locally to give their knowledge away as well as to use the knowledge that comes from another group – the not invented here syndrome" (Nonaka, Ichoji & Von Krogh, 2000)

- The second step is to codify/to represent existing information (it's of strategic importance to define what and how you want to codify) in a form that makes it accessible. "The codification turns knowledge into a code to make it as organized, explicit, portable, and easy to understand as possible"(Davenport & Prusak, 1998). The main goal is, of course, to share and to transfer knowledge throughout the organisation. This is part of the organisational life. In each situation (conversation, requests.), we transfer knowledge whether we control all the process or not.
- Knowledge transfer involves two actions: "transmission (sending or presenting knowledge to a potential recipient) and absorption by that person of group. If knowledge is not absorbed, it has not been transferred. Access is necessary but by no means sufficient to ensure that knowledge will be used. "Too often, knowledge transfer has been confined to such concepts as improved access, electronic communication, document repositories, and so forth."(Davenport & Prusak, 1998).
- The goal of knowledge transfer is to improve an organization's ability to do things, and therefore increase its value. Even transmission and absorption are not sufficient if it does not lead to some change in behaviour. It is common for someone to

understand and absorb new knowledge but not put it to use for a variety of reasons"(Davenport & Prusak, 1998).

Neither the knowledge as such, nor the technical or organisational solution is sufficient to create innovations, new ideas… ICT/ICS can help to structure information, store and retrieve documents, but it is the use of information that matters. Sharing tacit knowledge is mostly difficult through cyber technologies and human computer interaction. Managing conversation in business settings is often required to counteract technological and competitiveness…

Therefore you need knowledge activists who constantly engage and motivate people, creating the enabling context. "These managers take a strategic view of knowledge, instil knowledge visions, tear down knowledge barriers, develop new corporate values like care and trust, catalyse and co-ordinate knowledge creation, manage the various contexts involved, develop a strong conversational culture and globalise local knowledge" (Nonaka, Ichoji & Von Krogh, 2000).

5.3 Discussion

Based on our analysis and on this model, we think that KNOWTECH and KNOWSYS often concentrate on localisation/ codification and transfer. To our point of view, KNOWORG considers the global transformation process from "capture, transfer and creation of new knowledge", which is a continuous ongoing process. The limits of this exploratory research are numerous, in the same time; many complementary studies could be drawn from it. In particular we could refine the ICT/ICT matrix related to the SECI model (Nonaka 1994). We could also go further into the different steps of

information flow in a technological context related to organisational and cultural dimensions like trust, power, employee behaviour, and corporate cultures… Additional research paths are suggested. Each time there is a new technology or system, the organisation and the transformation process of information has to be adapted. This means re-analysing, re-formulating the existing information. Take for example, the evolution of ERP systems in consideration, the opportunities of modelling languages. Secondly, what are the time needed and the limits of the process of transferring knowledge? It is obvious that organisations should re-evaluate their needs as the situation changes. To what extent can we trust the ICS/ICT tools and the use of it ?

Acknowledgements

The authors would like to thank Jean Vanderdonckt for his enthusiastic support and many others for their comments on earlier versions of this paper. We also acknowledge members from KNOWTECH, KNOWSYS and KNOWORG for their support.

Appendix 1. List of meta codes, codes and sub-codes.

BEHAV: behaviour, *related codes* (sub codes) (RESIST resistance, PROACT , proactive behaviour,…): CONSACT: actions taken by the consultant; CONSEN: Consensus; CULT= Cultural aspects. Related codes (sub codes) (CULTFIT= fit between cultures or subcultures (groups): CULTCLASH clash between cultures.; DIAL: Dialogue; ENAB= enabler; EVAL: evaluation (of results, outcomes,) EXEC, executives; EXIST: situation in place ;FLEXSYST = flexibility of the system; ICT = Information and communication Technologies: ;ICS= Information and communication systems.; INHIBIT: inhibitor (of Info transfer or knowledge creation);INFO= Information: *sub codes:* ACCESSINFO= access to…TRANSINFO = transfer of , SHARINFO = sharing of i, STORINFO = storage of , etc…;INFOVERLOAD: Information overload; INVOLVEMENT: involvement (individuals) in the process; KSF= Key success factor; KC-KD= Knowledge creation- Knowledge Development; KM= Knowledge Management; LEAD: Leader ; MANACT= managerial actions. Sub codes: REWARD, CONTROL, etc…
MAP= Mapping (of INFO Sources, Flows,…); MIDMAN: Middle Management, ;MISCONS: Mission of the consultant; ORGCONT= organisational context , sub codes: ADM CONT = Administrative context, MEET = meetings, RELAT: relations between individuals and groups ; PREREQ= Prerequisite (for KM); RES: results or outcomes; ROLE: role played by individuals.; SPEC= Specialists:

SUPPORT= support of TOP, MID SPECIAL; TEAM, team, etc.. ; TECHNO: technologies; TECHSOL= technological solutions; TOP=top management; US= end user; VIS= Vision

More frequent Meta Codes and Combinations.
KNOWTECH Isolated: resmanact **Combined: ICT/ICS platform:** ksf/infosyst, consact/techno, techcontext/consact/consprocess, stage/process. **Combined Organisational/behavioural platform**: Team/multi, consact/behav, behav/resist/transinfo, misconsult/transinfo, behav/transinfo, cult/behav, org/context, org/context/manact (2) orgcontext/manact/resmanact/behav, dialogu/cons/users, behav/user, behav/orgcontext, dialogu/behav, orgcontext/team/relat/cons/us, team/lead/role, ksf/lead/role/behav. **Combined ICT/ICS and organisational/behavioural platforms:** Flexsyst/cons, dialogue/technosol, behav/techcontext (2), consprocess/techncontext/infocost/ ksf/behav/involv/techn, info/creat/kn

KNOWSYS: Isolated: Context; Info storage, Consensus, Access to info; Existing Knowledge**. Combined: ICT/ICS platform (**ICT/Struct; Exist/ICS: Prereq/ICS; Exist/map/Ics; Enab/ics; Flow/qualinfo: enabl/ict; Infosource/interact; Struct/info; info/qual. Combined **Organisational/behavioural** platform: Behav/manact/educ: Tac/explic; Units/orgcontext; Vis/cult. Combined **ICT/ICS and organisational/behavioural platforms.** Infoqual/infoquant/Usneed; ICS/Dialog

KNOWORG Isolated: technolconcept, exist, accesinfo, infoverload**: Combined: ICT/ICS platform:** Ict/ics/revol, tech/innov, tech/r&d, ict/support, cost/ict. **Combined Organisational/behavioural platform:** Unit /behav, process/behav/orgcontext, invol/pers, kc/behav (3), tac/expl/rel (3), val/kc/behav, process/manact, soc/behav**. Combined ICT/ICS and organisational/behavioural platforms:** (2), r&d/process, hum/behav/ict/ics, tech/strat/manact, ics/infostore/orgcontext, inhibit/behav/transf, enable/inhib/strat/cult/struct

References.

Andreu, R. & Ciborra, C. (1996). Core capabilities and information technology: an organisational learning approach. In Moingeon B & Edmondson A. (Eds, 1996**)** *Organizational learning and competitive advantage"*. Sage Publications.

Bontis, N. ,Girardi, J. (2001), article on Celemi's Web Site (courtesy of the authors).

Byosiere, P. & Ingham, M. (2001). *Création de connaissances et innovations*. Revue Française de gestion**,** Mars-avril-mai 2001, pp 104-112.

Castells, M. (1996). *The rise of the Network Society*. Blackwell Publishers, Oxford

Cohen, D. (1998).*Towards a knowledge context*. California Management Review, Vol 40-3, Spring .

Davenport, T. & Prusak, L. (1998) *Working Knowledge*. Harvard Business School press. David, A. (1998). *Models implementation: a state of the art.* Paper presented at the 1998 Euroconference , (Brussels).

Despres, C. & Chauvel, D. (2001). Developing a Conceptual Map of Knowledge Management in Action". In *Knowledge and Value Development in Management Consulting*, *proceedings of the First International Co-sponsored Conference - Management Consulting Division, Academy of Management,* ISEOR, HEC, pp 89-106.

Fisher, M. (2001). On the interaction of Management Consultant and Client with special focus on transfer and development of Knowledge. In *Knowledge and Value Development in Management Consulting*, *proceedings of the First International Co-sponsored Conference -Management Consulting Division, Academy of Management,* ISEOR, HEC, pp; 215-224.

Galliers, D. & Baets J. (2000). *Information Technology and Organizational Transformation*, Wiley.

Giddens, A. (1990). *The Consequence of Modernity : The Raymond Fred West Memorial Lectures.* Stanford University Press, Stanford, CA.

Häkanson, L. (2001). "*Beyond Tacit Knowledge: the Power and Logic of Articulation", EBF* (European Business Forum), *N°5-spring 2001.*

Landry, M., Banville C, & Oral, M. (1996). *Model legitimization in operational research* European journal of operational research,- 92.

Machlup, F. (1983). Semantic Quirks in Studies of Information. In Machlup F., Mansfield, U. (Eds), *The Study of Information*, New York, John Wiley.

Miles, M.B., Huberman, A.M. (1994). *Qualitative data analysis*, Sage, Newbury Park, Ca.

Nonaka I. (1994). *A dynamic Theory of Organizational Knowledge Creation, Organization Science,* Vol 5-2.

Nonaka, I. & Takeuchi, H. (1995). *The knowledge Creating Company; how Japanese companies create the dynamics of innovation* . Oxford University Press.

Picq, T. (2001). Building Learning Organization in Management Consulting in *Knowledge and Value Development in Management Consulting*, *proceedings of the First International Co-sponsored Conference Management Consulting Division- Academy of Management, ISEOR,* HEC, pp; 107-127

Seely-Brown , J.& Duguid, P. (2001). *The Social Life of Information* , Harvard Business School Press.

Seely-Brown , J.& Duguid, P. (2001). *Knowledge and Organization : A Socail Practice Perspective in Organization Science, vol 12, n°2, March-April 2001,* pp 198-213.

Traetteberg, H. (2002). *Using user interface models in design,* ch 12.

Von Krogh, G., Ichijo, K. & Nonaka, I. (2000). *Enabling knowledge creation*, Oxford University Press.

Werr, A. & Linnarson, H. (2001). Management Consultant for Client Learning ? Clients' Perceptions on learning in management consulting . In *Knowledge and Value Development in Management Consulting*", *proceedings of the First International Co-sponsored Conference Management Consulting Division- Academy of Management, ISEOR, HEC* ,p 225-253

Winter, S. (1987). Knowledge and competence as strategic assets, in Teece D. (Eds.). *The competitive challenge: strategies for industrial innovation and renewal* , Ballinger, Harper and Row,1987, Chap 8.